

Announcements

▣ Homework for tomorrow...

(Ch. 25, CQ 2, Probs. 4 & 6)

CQ10: A is *negative*

25.16: zero

25.34: 1.8×10^{-5} N, 0° from x -axis

25.38: 1.8×10^{-4} N, 52° CW from x -axis

Office hours...

MW 10-11 am

TR 9-10 am

F 12-1 pm

▣ Tutorial Learning Center (TLC) hours:

MTWR 8-6 pm

F 8-11 am, 2-5 pm

Su 1-5 pm

Chapter 26

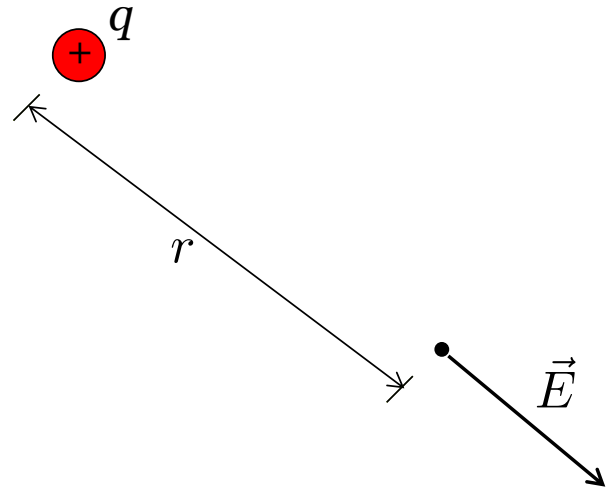
The Electric Field

*(E-Field Models & E-Field of Multiple
Point Charges)*

Last time...

- The *Electric field* is defined as...

$$\vec{E} \equiv \frac{\vec{F}_{on\ q'}}{q'}$$



- The *magnitude of the E-field* of a pt. charge is...

$$E = \frac{Kq}{r^2}$$

Permittivity constant..

- Define a new constant..

$$K = \frac{1}{4\pi\epsilon_0} = 8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$$

- so that...

$$\epsilon_0 = \frac{1}{4\pi K} = 8.85 \times 10^{-12} \frac{\text{C}^2}{\text{Nm}^2}$$

- Coulomb's Law becomes...

$$F_{12} = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$$

Electric Fields & Superposition

□ Q: @ P , what is the E -field?

P
•

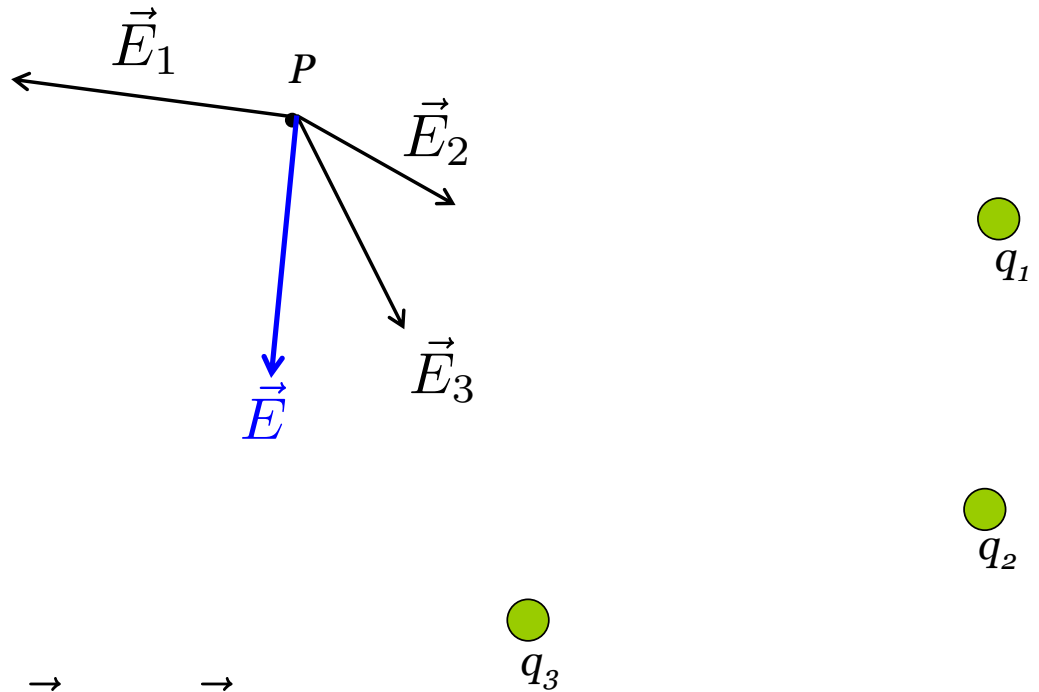
q_1

q_2

q_3

Electric Fields & Superposition

□ Q: @ P , what is the E -field?



□ A: @ P ,

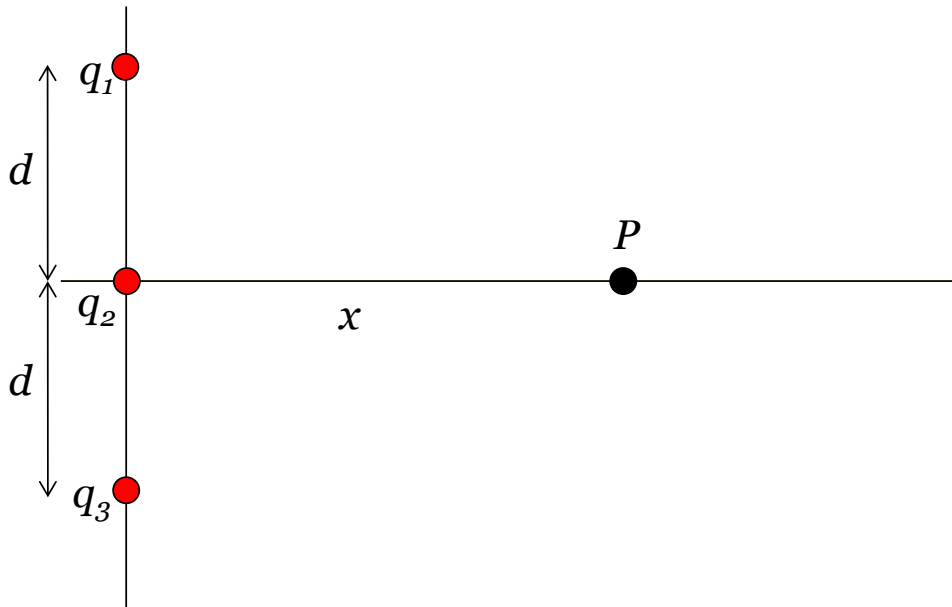
$$\vec{E} = \vec{E}_1 + \vec{E}_2 + \vec{E}_3$$

i.e. 26.1:

The electric field of 3 equal pt. q 's

Three equal positive point charges q are located on the y -axis at $y = 0$ and at $y = \pm d$.

What is the electric field at a point on the x -axis?

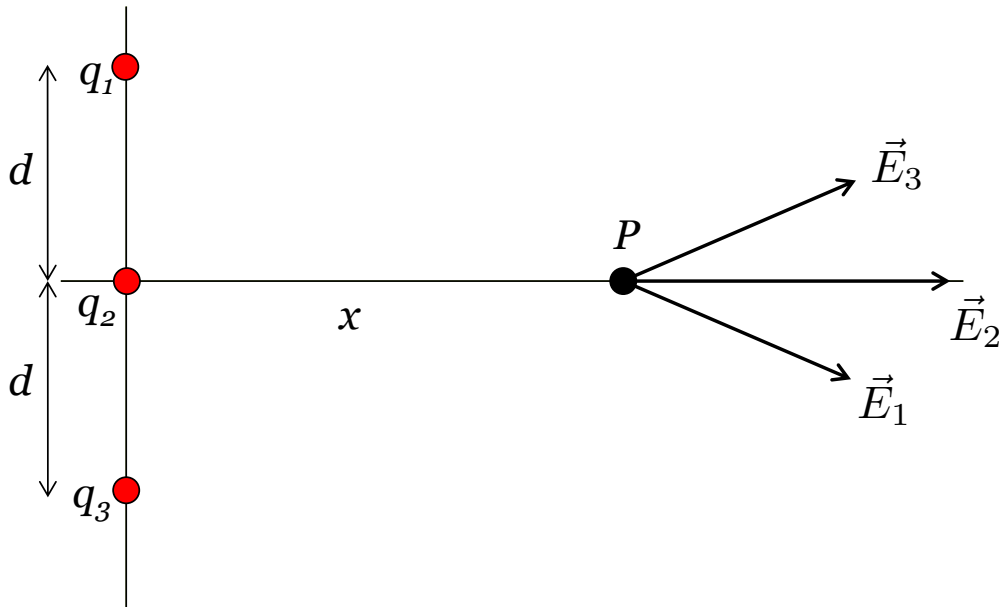


i.e. 26.1:

The electric field of 3 equal pt. q 's

Three equal positive point charges q are located on the y -axis at $y = 0$ and at $y = \pm d$.

What is the electric field at a point on the x -axis?



The Electric Field of a Dipole

An *Electric Dipole* is...

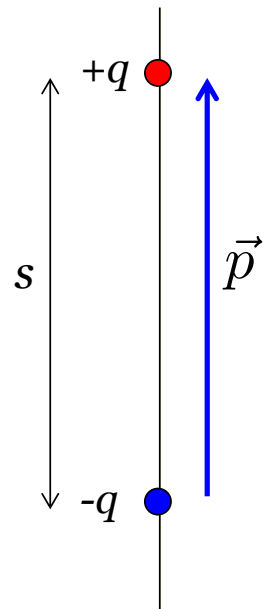
- 2 *equal* but *opposite* charges separated by a *small distance*.

Kinds:

- *Permanent* Electric Dipole (i.e. H_2O)
- *Induced* Electric Dipole (i.e. polarized atom)

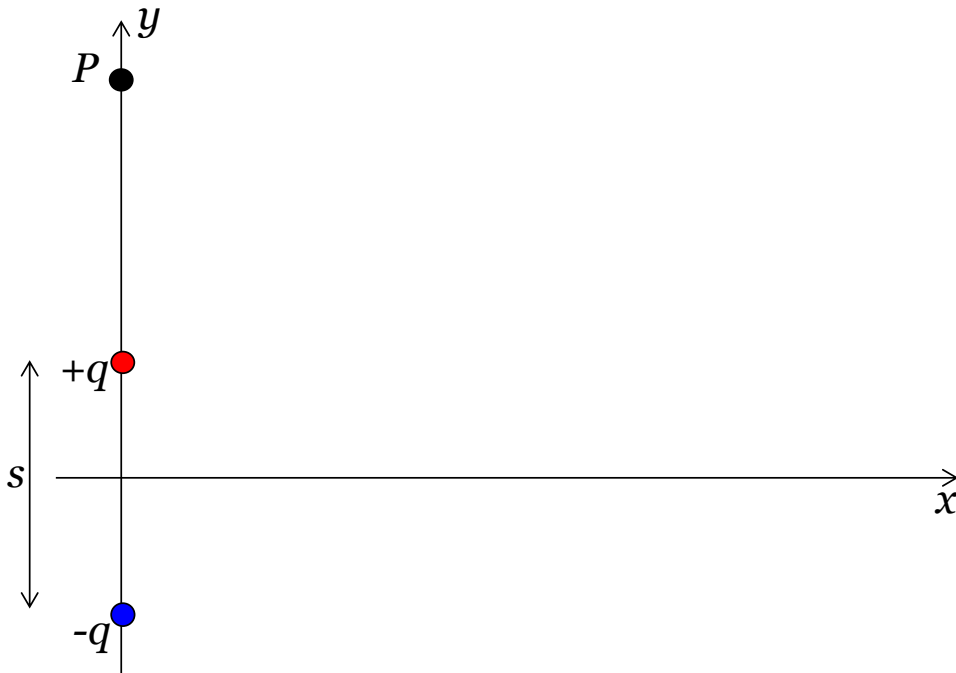
- *Dipole Moment...*

$$\vec{p} = qs, \text{ from the - to + charge}$$



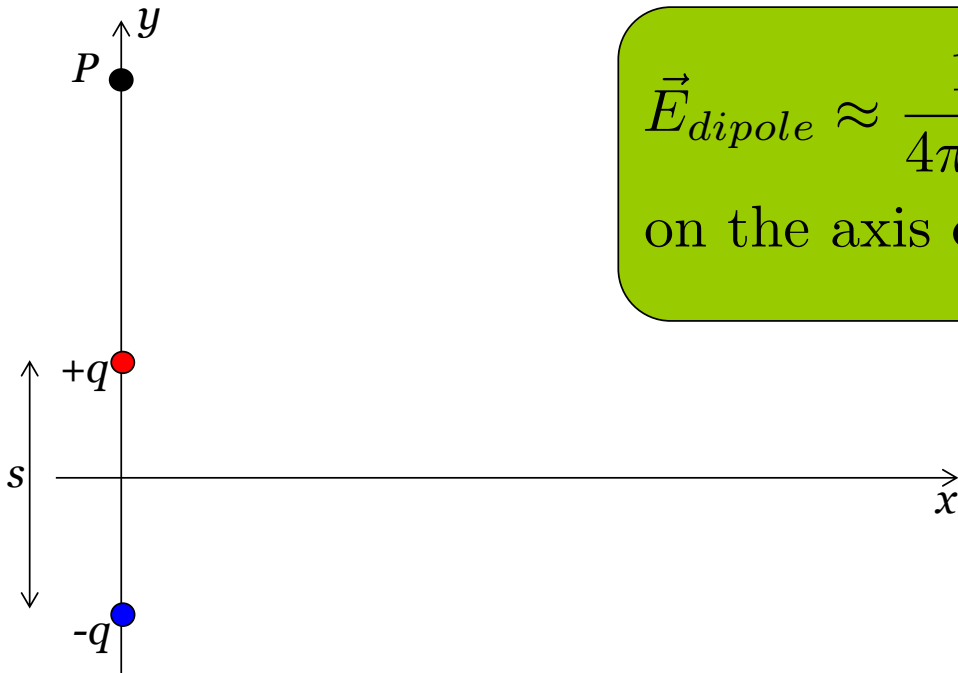
The Electric Field of a Dipole

Calculate the *electric field* of a dipole on the *axis of the dipole*...



The Electric Field of a Dipole

Calculate the *electric field* of a dipole on the *axis of the dipole*...



$$\vec{E}_{dipole} \approx \frac{1}{4\pi\epsilon_0} \frac{2\vec{p}}{r^3},$$

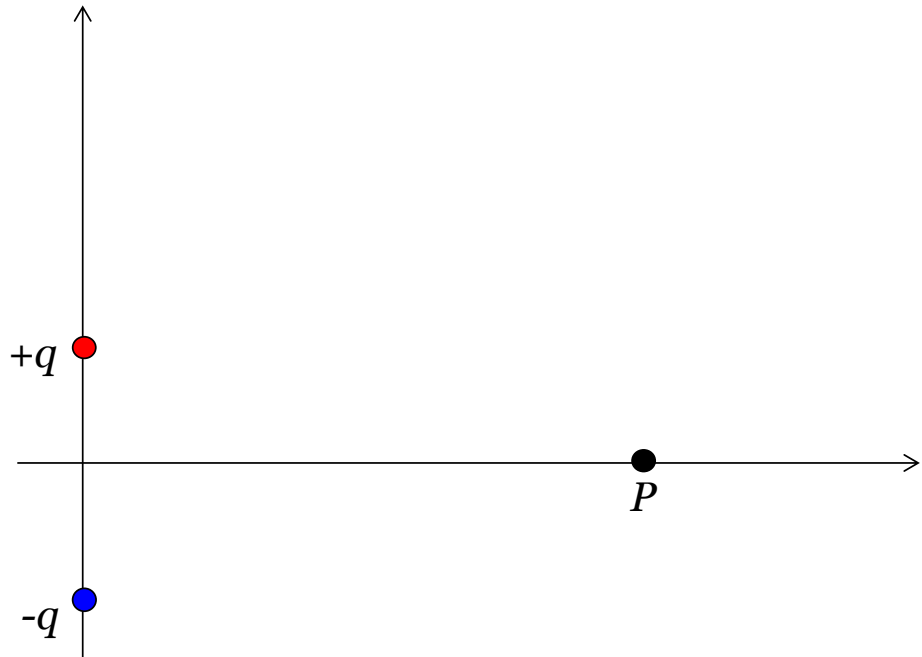
on the axis of the electric dipole

Notice: r is distance measured from the *center* of dipole.

Quiz Question 1

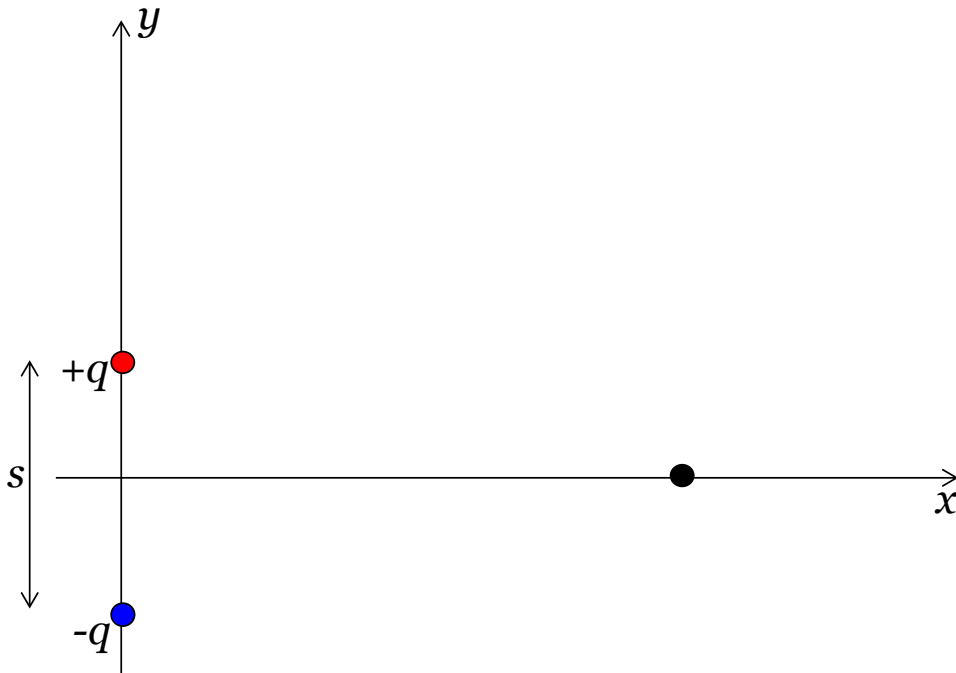
The diagram shows a positive charge $+q$ and a negative charge $-q$ with the *same* magnitude. The electric field at point P on the *plane that bisects the dipole* is:

1. Up.
2. Down.
3. Left.
4. Right.
5. Zero.



The Electric Field of a Dipole

Calculate the *electric field* of a dipole in the *plane that bisects the dipole*.



The Electric Field of a Dipole

Calculate the *electric field* of a dipole in the *plane that bisects the dipole*.

